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ABSTRACT

Incidental learning research with mentally retarded children has produced findings inconsistent with those reported for the intellectually normal population. This study was designed to further investigate the efficacy of incidental semantic classification instructions relative to taxonomic classification instructions or superficial color classification instructions with a normal population of children. Forty-four children in grades 2 and 3 were instructed to categorize 18 common pictures by taxonomic category (animals, people, vehicles), by size (big, little, in between), or by color (blue, green, red) in an incidental learning paradigm. The pictures were selected from the Peabody Picture Vocabulary Test. Subjects receiving taxonomic instructions recalled significantly more items and showed significantly better clustering than subjects receiving the other instructions. These results with normal children supported previous Type I incidental learning results with retarded children. (Author/RL)

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Incidental Learning and Recall in Children

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Paper presented at the Annual
Meeting of the Psychonomic Society
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Abstract

Forty-four second and third grade children were instructed to categorize 18 common pictures by taxonomic category (animals, people, vehicles), by size (big, little, in between), or by color (blue, green, red) in an incidental learning paradigm. Subjects receiving taxonomic instructions recalled significantly more items and showed significantly better clustering tham subjects receiving the other instructions.

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The levels of processing model for memory research (Craik & Lockhart, 1972) which has recently been elaborated (Jacoby & Craik, 1979) maintains that stimuli processed to deep cognitive levels will be retained to a greater degree than material processed superficially. The Type I incidental learning paradigm (Postman, 1964) has been used to assess the memory processing model. Incidental learning research with children (e.g., Owings & Baumeister, 1979) has generally supported the levels theory of memory processing.

Murphy & Brown (1975, Experiment 2) provided preschool normal children three different incidental orienting activities: semantic classification-placing pictures into nice, nasty, and in-between categories; taxonomic classification-placing pictures into class name categories (e.g., toys, wild animals, people); and superficial classification-placing pictures into categories based on the colors present in the pictures. Both the semantic and the taxonomic classification instructions resulted in recall superior to that found in the superficial condition. The first two conditions, designed to produce deeper levels of processing than the superficial activity did not differ from each other on a recall measure. Murphy and Brown concluded that: "Memory in children as well as adults is a function of comprehension or initial processing. If a task requires a consideration of the meaning of the items, good performance will accrue, whether or not the optimal strategy of taxonomic categorization is induced (p251)."

Incidental learning research with mentally retarded children has produced findings inconsistent with those reported for the intellectually normal population. Fox & Rotatori (1979) found that a taxonomic classification condition produced greater and more durable recall than did semantic, superficial, or intentional learning conditions. Their semantic condition consisted of instructions to classify the pictures as "good," "bad," or "in-between." Fox & Fulkerson (1980) in a follow-up study with retarded children also found that subjects who received incidental taxonomic instructions recalled significantly more items than

subjects receiving incidental semantic or intentional control instructions. In Fox & Fulkerson's incidental semantic condition, subjects were instructed to classify the pictures as "big," "little," or "in-between." The present study was designed to further investigate the efficacy of incidental semantic instructions relative to taxonomic categorize or superficial color instructions with a normal population of children.

METHOD

Subjects and Experimental Design

Subjects were 44 normal second and third grade children, 17 males and 27 females, from a public elementary school in Macomb, Illinois. The children ranged in age from 7.25 to 9.92 years of age. A randomized-block design with age as the block variable was used to establish the age equivalence of the three orienting instruction conditions (taxonomic, semantic, color).

Task Materials

The stimuli chosen as the experimental task were 18 common pictures, approximately 8 X 9 cm in size, selected from the Peabody Picture Vocabulary Test. The pictures were selected to represent easily identifiable objects so that the question, "Is this one big, little, or in-between?" would be reasonable. The 18 pictures represented three taxonomic categories with six pictures in each: people-man, girl, baby, woman, clown, soldier; animals-dog, squirrel, horse, chick, cat, cow; and vehicles-train, car, truck, bicycle, wagon, boat. Within each of the categories two of the pictures were colored red, two green, and two blue.

Experimental Procedure

Subjects were seen individually in a quiet area in the children's school. Each child was exposed to the task materials and one set of orienting instructions. The task materials were shuffled and stacked, face downward, in a single pile, before each child entered the testing area. For each of the three orienting

instruction conditions, the subject was required to turn the pictures face upward, one at a time.

The specific procedures for the three orienting instruction conditions were as follows:

(1) Taxonomic classification instructions (taxonomic)

In this condition the subjects were instructed to label the pictures and to put all the people, animals and vehicles together in spatially separate groups. After all of the groups were assembled, the children were instructed to name all of the pictures in each group for a total of 2 min (e.g., "Tell me all of the people.")

(2) Semantic classification instructions (semantic)

The subjects were instructed to label the pictures and to put them in three groups: "big," "little," or "in-between." Three circles (8,5, and 2 cm in size) were placed on the table in front of the child approximately 8 in apart to facilitate the child's location of the pictures. After the groups were assembled, the subjects were instructed to name all pictures in each group for a total of 2 min (e.g., "Tell me all of the big things").

(3) Color classification instructions (color)

The subjects were instructed to label the pictures and to put all the red, green, and blue pictures together in spatially separate groups. After all of the groups were assembled, the children were instructed to name all of the pictures in each group for a total of 2 min (e.g., "Tell me all of the red pictures").

The two minute time limit for the orienting activity was standard for all conditions. After the subjects completed the 2-min orienting activity, the task items were removed from their vision. Subjects were then asked to verbally recall as many items as possible. After it was clear that the subjects had finished their recall, a cued recall condition was given. The experimenter provided the three class names appropriate to each condition to all subjects to elicit additional responses.

Results

A one-way analysis of variance was used to establish the equivalence of the three experimental groups on age, the blocked variable. The means and standard deviations for the taxonomic, semantic, and color groups were 8.46 and .70, 8.38 and .66, and 8.51 and .71, respectively. The analysis of variance indicated that the subjects in the three groups did not differ significantly in age ($F < 1$).

The means and standard deviations for the free recall and cued recall tasks are presented in Table 1. A one-way analysis of variance of the free recall data indicated that the three groups differed significantly [F (2/41)= 5.29, $p < .01$]. Duncan's test revealed that the taxonomic instruction group recalled significantly more items than the color instruction group (Duncan's $p < .01$). In addition, there was a strong non-significant tendency (Duncan's $p < .10$) favoring the taxonomic group over the semantic group. There was no significant difference between the semantic group and the color group.

Insert Table 1 about here

The analysis of variance of the cued recall data also indicated that the three groups differed significantly [F (2,40) = 8.52, $p < .01$]. Once again Duncan's test revealed that the taxonomic group did significantly better than the color group ($p < .01$). In addition, the taxonomic group did significantly better than the semantic group (Duncan's $p < .05$). There was no significant difference between the semantic group and the color group.

Additional analyses were done on the amount of taxonomic clustering in the three groups regardless of the type of instructions given. The measure of clustering used was the adjusted ratio of clustering. ARC= R - E (R)/max R - E (R), where R = total number of observed category repetitions and E (R) = expected or chance number of category repetitions (Roenker, Thompson, & Brown,

1971). An analysis of variance indicated that the three groups differed significantly in the amount of taxonomic clustering in free recall [F (2,41)= 20.79 p <.001]. As might be expected, Duncan's test indicated the amount of taxonomic clustering in the taxonomic instruction group ($\bar{X}$ = .91) was significantly greater than the amount of taxonomic clustering in the semantic instructions group ($\bar{X}$ = .19) and in the color instructions group ($\bar{X}$ = .10).

A more meaningful measure of clustering would be the ARC for taxonomic clustering in the taxonomic group versus the ARC for semantic clustering in the semantic group versus the ARC for color clustering in the color group. Unfortunately, the subjective clustering data for subjects in the semantic group was not collected. Therefore, the only comparison which could be made was between the ARC scores for taxonomic clustering in the taxonomic group and the ARC scores for color clustering in the color group. An independent t test revealed that significantly more taxonomic clustering occurred in the taxonomic group ($\bar{X}$ = .91) than color clustering occurred in the color group ($\bar{X}$ = .40) [t (28) = 3.64, p <.01].

Discussion

The results of the present experiment with normal second and third grade children supported previous Type I incidental learning results with retarded children (Fox & Rotatori, 1979; Fox & Fulkerson, 1980). The taxonomic classification instructions produced higher and more organized recall than either the semantic instructions or the color classification instructions. However, as indicated earlier Murphy & Brown (1975) in a previous study with normal preschool children found recall in their semantic condition to be equivalent to recall in their taxonomic condition.

The total amount of free recall in the Murphy & Brown experiment was not very high in any of their conditions. The mean percentage of pictures recalled freely in their taxonomic condition was 40% compared with 38% in their semantic

condition, and 18% in their color condition. In the present experiment the subjects in the taxonomic condition freely recalled 76% of the pictures compared to 63.5% in the semantic condition and 55% in the color condition. The average age of the subjects in the Murphy & Brown study was 4 years, 9 months, while the average age of the subjects in the present experiment was 8 years, 6 months. It may well be that not only do younger subjects recall fewer pictures than older subjects, but that taxonomic classification is not a clear-cut optimal strategy for very young children. For them, semantic classification of items into categories like "nice" and "nasty" may be just as optimal a strategy as classifying the items taxonomically. For older normal or retarded children and adults, however, taxonomic classification may well be the optimal strategy.

Further factors may be involved in the failure of the semantic instructions to produce recall equivalent to the taxonomic instructions in the two studies with retarded children, as well as in the present study. First of all the orienting activity imposed by the taxonomic instructions was very familiar to all the subjects. Both normal and retarded children had no difficulty placing the task items into taxonomic categories and repeating the item labels for the 2-min orienting periods. Thus confusion over instructions and related distractions were minimal. In the semantic conditions the orienting instructions were novel and task placement into groupings like "big," "little," or " in-between" allowed a flexibility not present in the taxonomic conditions. Consequently, subjects varied considerably in terms of specific item placement. Also, it was clear in the last two of the Fox studies that some subjects were classifying the task items according to their phenomenal (e.g., picture size) rather than their real-life size. These problems in instructions and item placement increased the potential for subject confusion.

The directed and sustained subject attention present in the taxonomic con-

ditions may have resulted in deeper processing of the task items than in the semantic conditions and contributed to the superior recall performance of the taxonomic groups. It appears that the class names in the taxonomic conditions (e.g., people, animals, and vehicles) were more specific and circumscribed retrieval cues (i.e., made better associations between the class names and other information already in the subjects repertoire) than the semantic group names (e.g., big, little, and in-between). Also, the task stimuli (e.g., 18 pictures) represented better instances of the class names in the taxonomic conditions than in the semantic conditions, which would certainly enhance their association in memory.

Table I

Means and Standard Deviations for Free Recall and Cued Recall as a Function Of Instruction Conditions

Condition	Free Recall		Cued Recall	
	Mean	S D	Mean	S D
Taxonomic	13.60	2.95	14.93	1.87
Semantic	11.43	3.59	12.77	2.92
Color	9.87	2.92	11.20	2.62

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